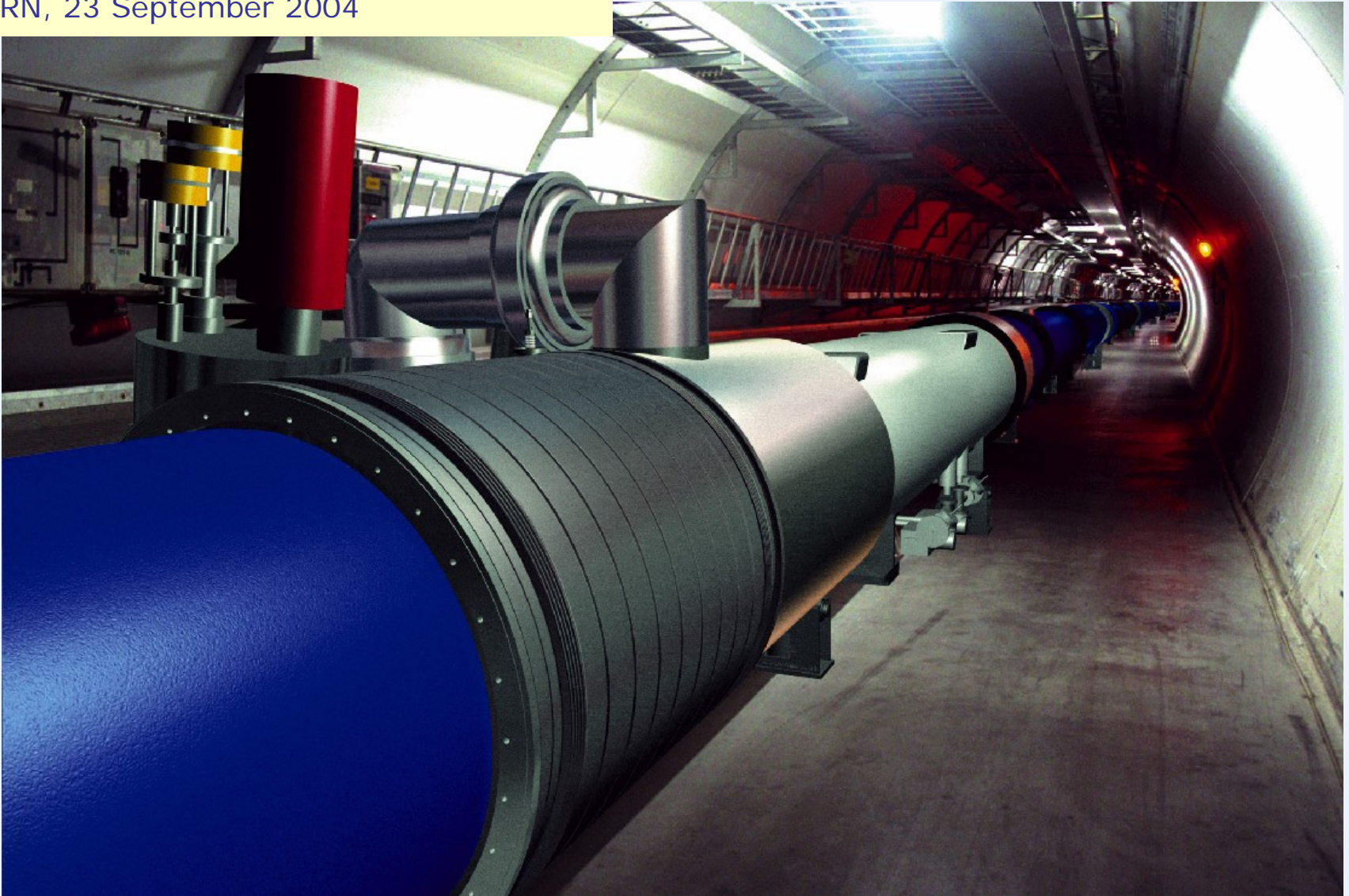


# Status of the LHC Project

Lyn Evans

HEPAP

CERN, 23 September 2004

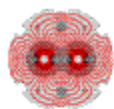




## T18 - MBIT



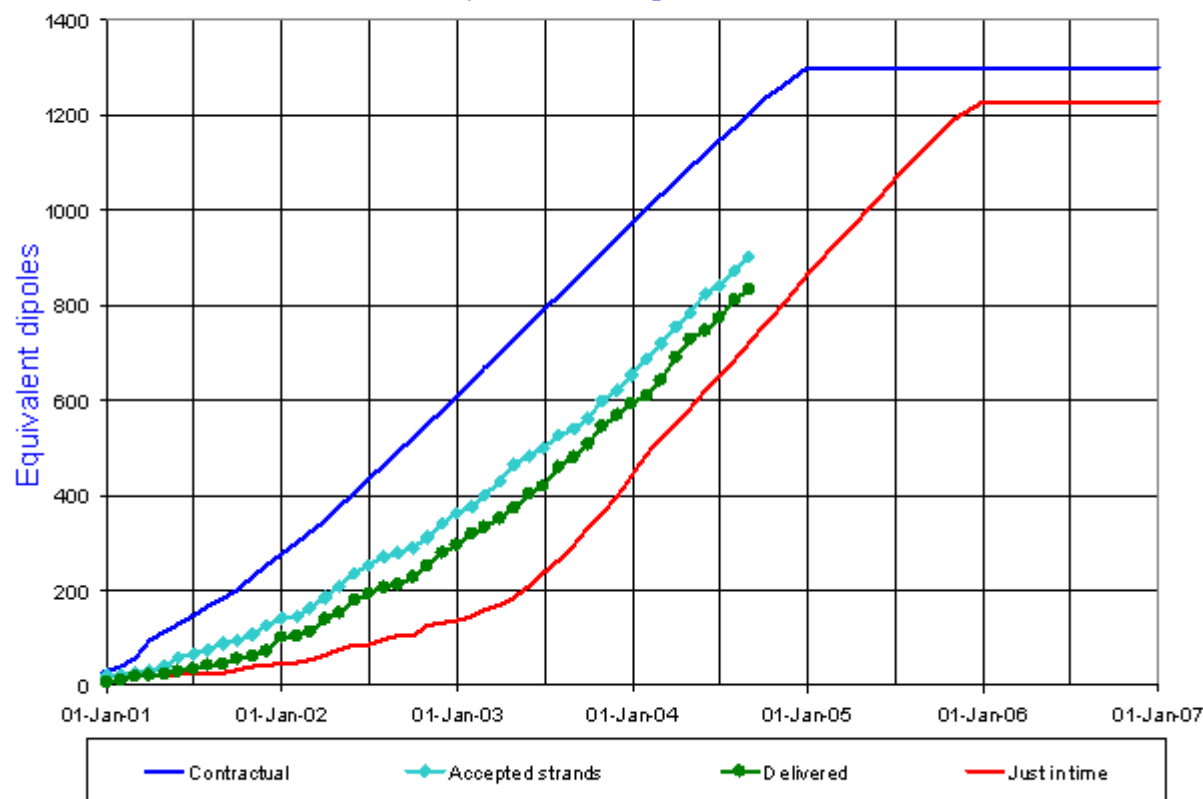
## Cable 1



### LHC Progress Dashboard



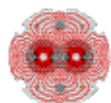
#### Superconducting cable 1



Updated 31 Aug 2004

Data provided by A. Verweij AT-MAS

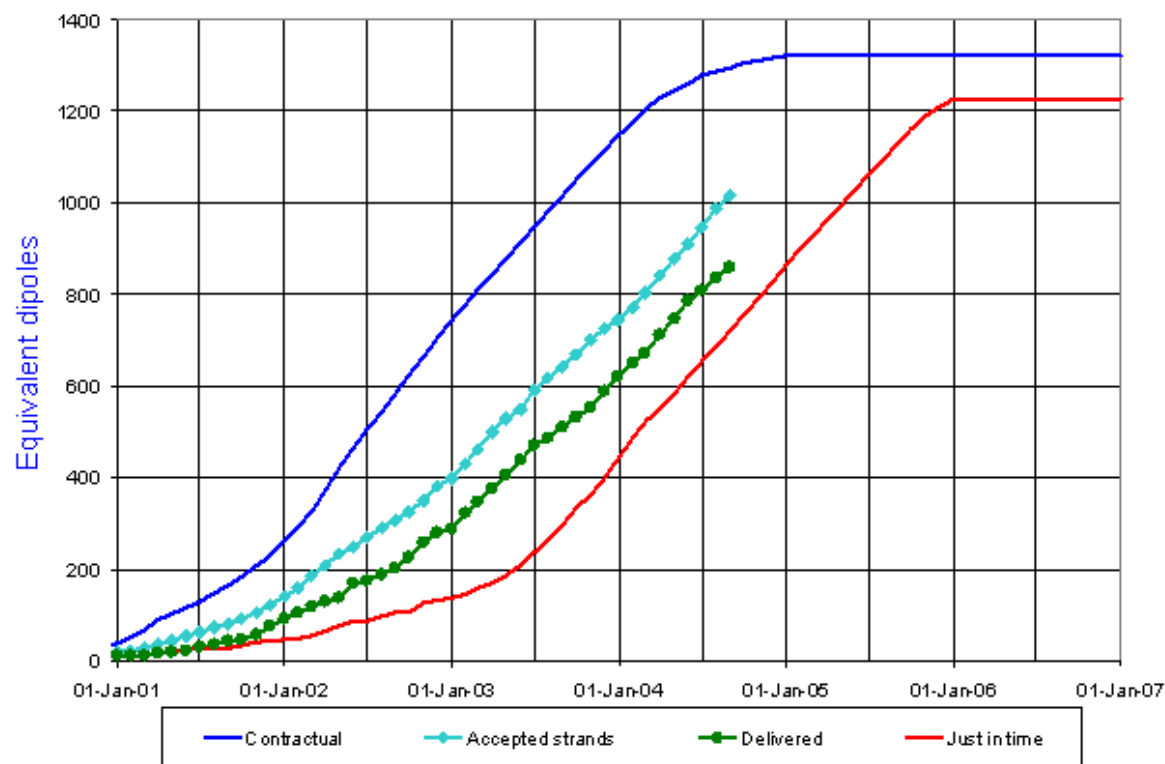
## Cable 2



LHC Progress  
Dashboard



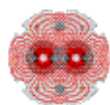
Superconducting cable 2



Updated 31 Aug 2004

Data provided by A. Verweij AT-MAS

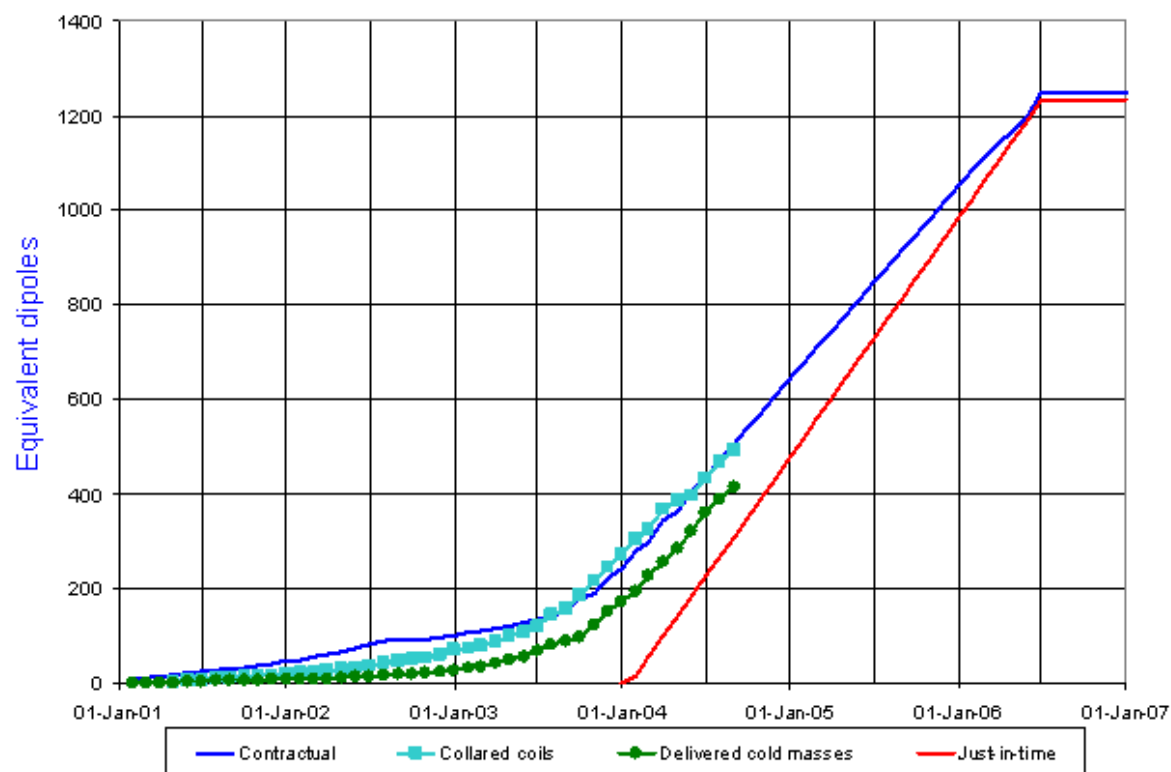
## Dipoles



### LHC Progress Dashboard



Dipole cold masses



Updated 31 Aug 2004

Data provided by P. Lienard AT-MAS

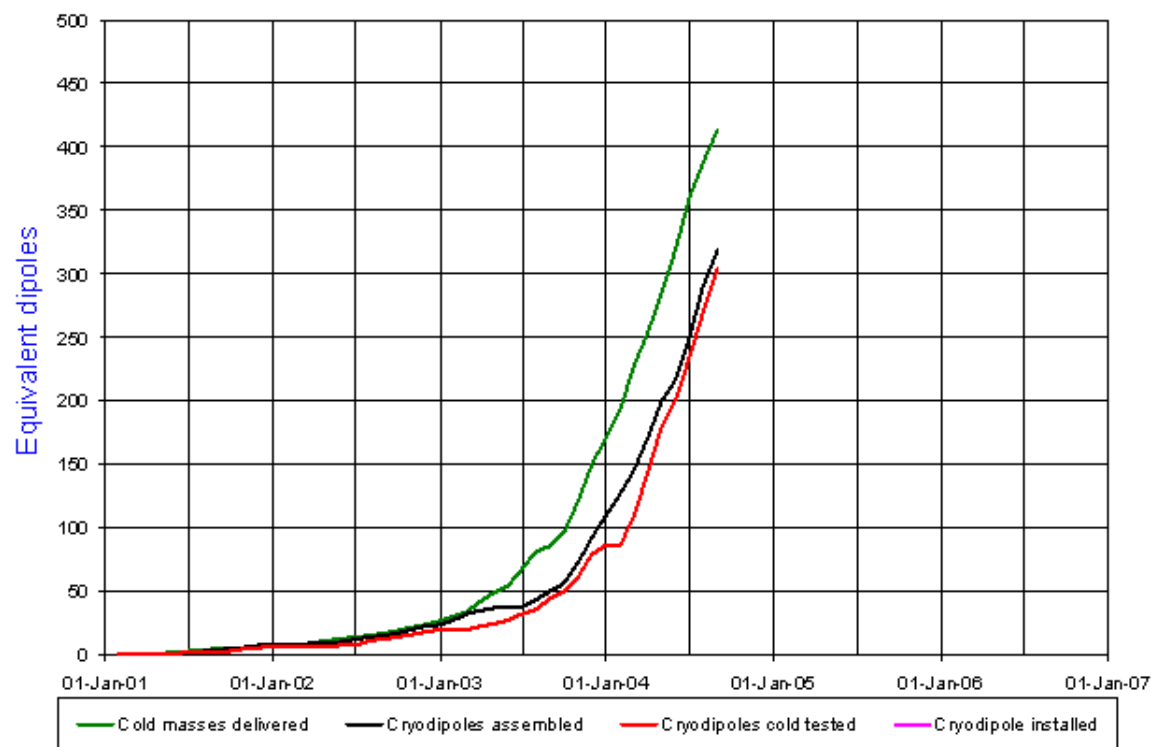
## Cryodipoles



### LHC Progress Dashboard



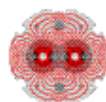
#### Cryodipole overview



Updated 31 Aug 2004

Data provided by D. Tommasini AT-MAS

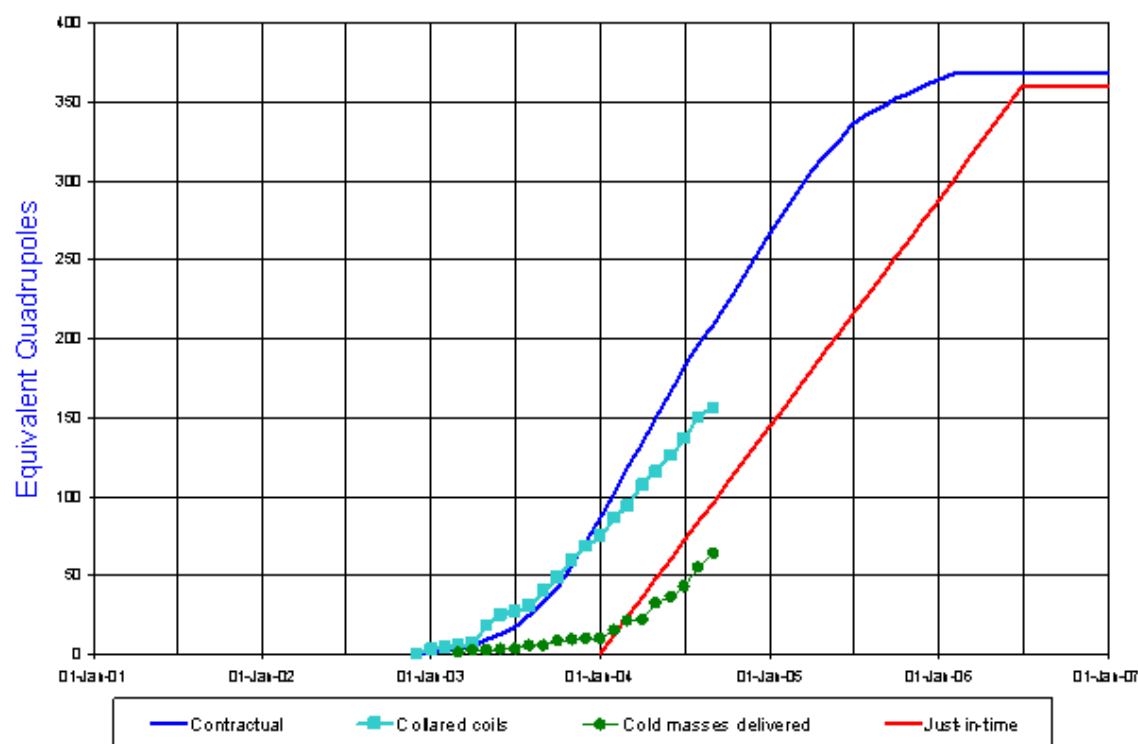
## Quadrupoles



### LHC Progress Dashboard



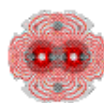
Quadrupole cold masses



Updated 31 Aug 2004

Data provided by T. Tortschanoff AT-MAS

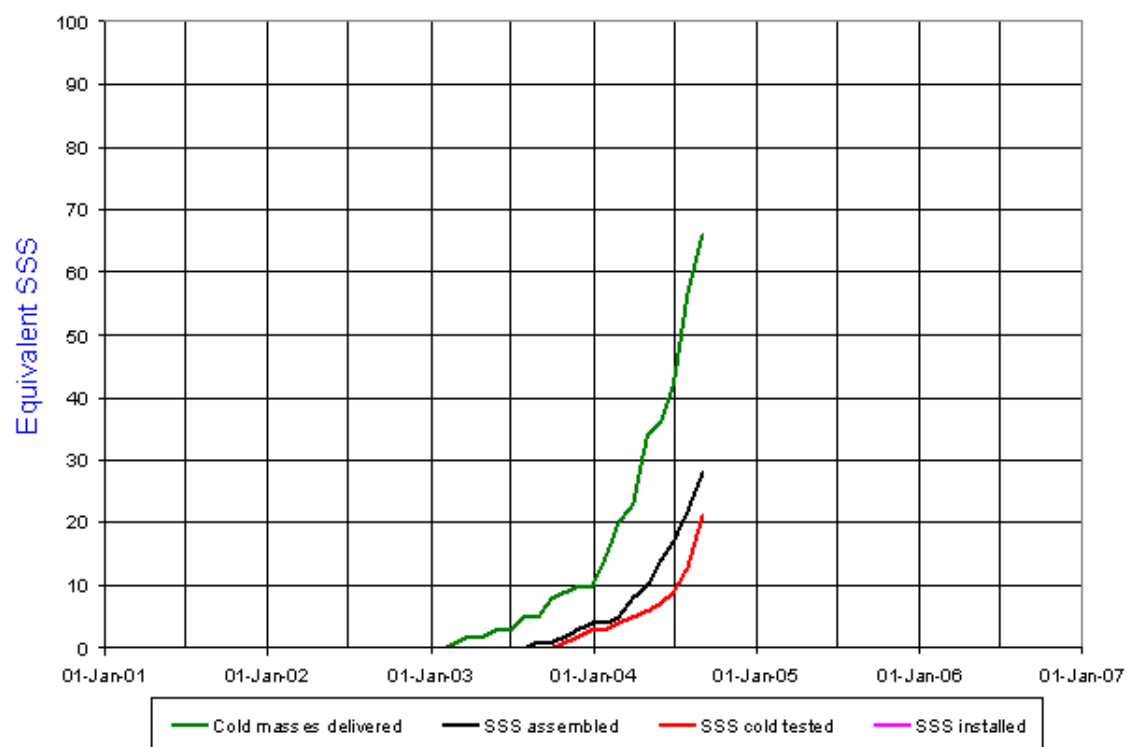
## SSS overview



### LHC Progress Dashboard



#### SSS overview



Updated 31 Aug 2004

Data provided by P. Rohmig AT-CRI



 Accelerator  
Technology  
Department

Figure 1 is a schematic diagram of the cryogenic distribution system for the LHC. The diagram shows a series of sectors (Sector 1-2 to Sector 8-1) connected by superconducting links. Each sector has a storage point (Point 1.8 to Point 8) and a distribution line. The distribution lines are color-coded: green for commissioned & accepted, red for delivered / under installation, orange for ordered (contract placed), blue for under fabrication, pink for under commissioning, and yellow for under definition. The diagram also shows the location of various cryogenic components: QSC (Warm Compressor Station), QSR (Surface 4.5 K Refrigerator Cold Box), QUR (Underground 4.5 K Refrigerator Cold Box), QURC (1.8 K Refrigeration Unit Cold Box), and QUI (Cryogenic Interconnection Box).

Data provided by L. Tavian AT-ACR





# QRL



## QRL History

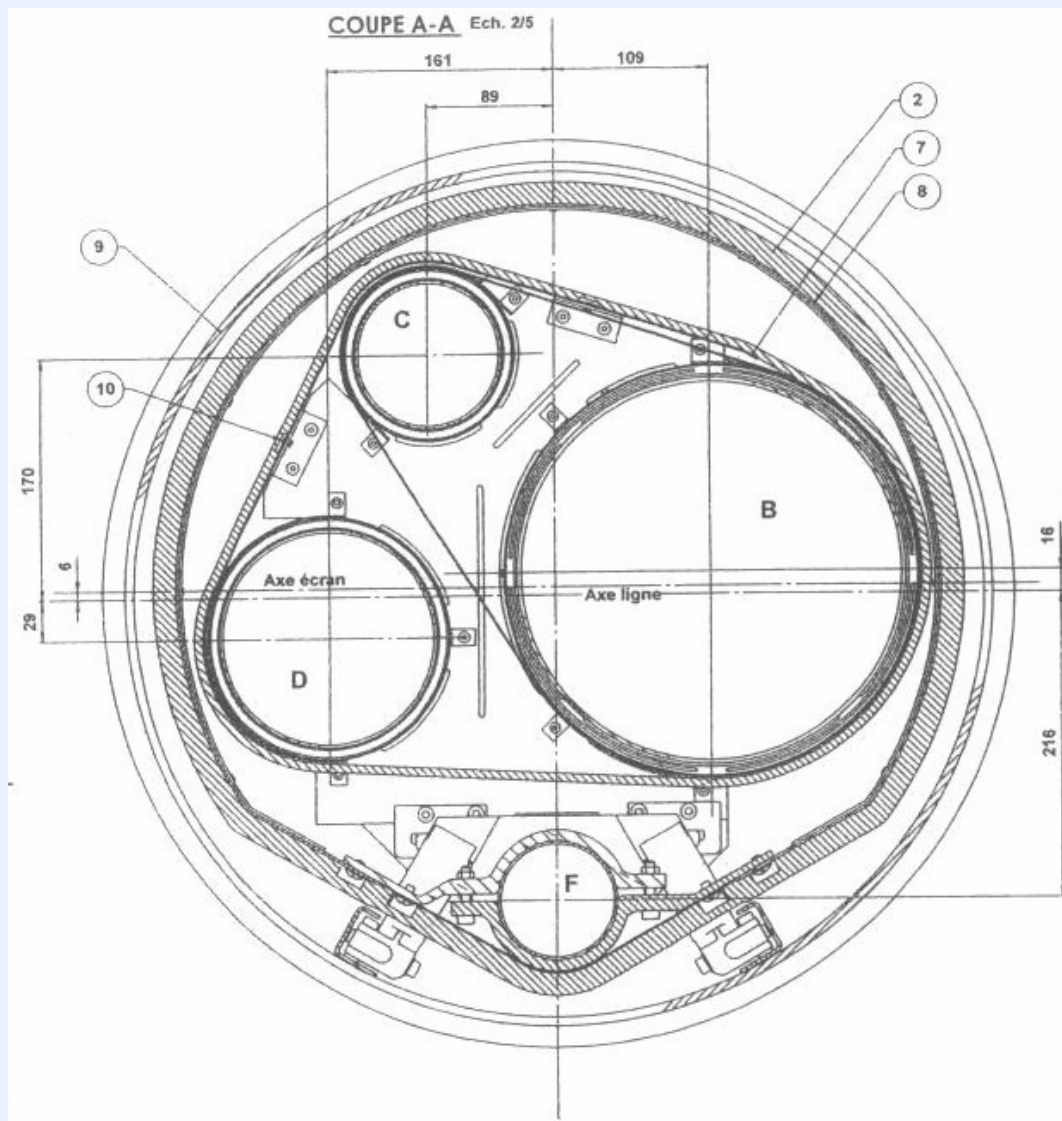
- Installation starts 21 July 2003.
- Suspended 9 October to 24 November 2003. Conflicts between AL and sub-contractor.
- Re-start 24 November. Contract broken between AL and sub-contractor 21 January 2004.
- New contract with Agintis 26 January 2004. Agintis declared insolvent 8 March 2004.
- Suspension of installation 3 May 2004. Many quality problems. Geometry, weld quality, procedures.



## QRL History (2)

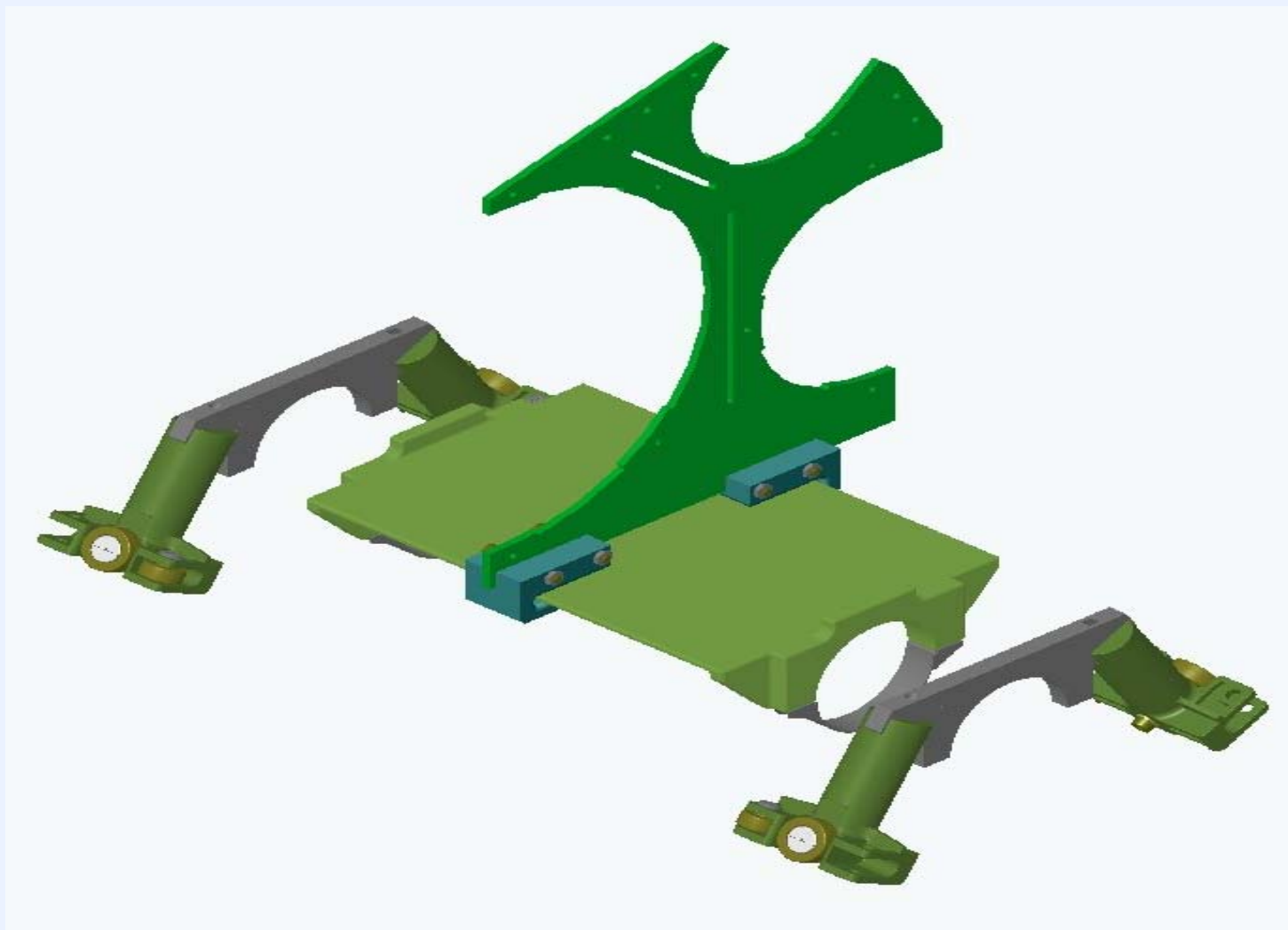
- Early June 2004 – leak detected on a pipe element. Extraction of pipe bundle mid-June revealed damaged tables.
- End of June 2004 – endoscopic examination revealed damaged tables in many pipe elements and service modules.
- CERN investigation reveals that tables are not moulded in conforming material. Resistance to shock an order of magnitude too low.
- July 2004 – CERN task force to verify QRL design. Production Restart Review 15 September 2004.
- Installation restarts 1<sup>st</sup> November.

## QRL





## Sliding table



## Sliding table



## Sliding table





### QRL History (3)

- About 600 pipe modules and 70 service modules need to be repaired. If it is done by AL, their production facility will be completely saturated.
- The repair will be made at CERN, in the main workshop for service modules and using dipole cryostating contract for pipe modules.
- A large amount of manpower will be available during a 5 week shutdown of SM18. We are preparing for a concentrated repair effort, including working during the Christmas closure.
- The consequence on the schedule can only be clearly assessed when installation restarts and is running smoothly.

## QRL Recovery Plan

- Qualify conforming material for component manufacture and restart production (15<sup>th</sup> September).
- Task force to verify mechanical design of the line to ensure that there are no more weak points (done).
- Set up a facility at CERN for the repair of pipe elements (ICS cryostating contract) and special elements (main workshop).
- Restart installation of sector 8-1 under good conditions with close CERN supervision. (1st November)
- Install local cabling in 7-8 before QRL restart.

## Conclusions

- Component delivery is proceeding at a rate compatible with a startup of the machine in summer 2007.
- The new QRL problems will cause delays in installation. The impact of these delays can only be reliably evaluated once QRL installation is proceeding smoothly.
- The order of installation has been reversed. Local cabling is now being done before QRL installation in order to try to minimize the impact of this additional setback.